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Wood Product Flows and Market Structure in the Rocky Mountain States

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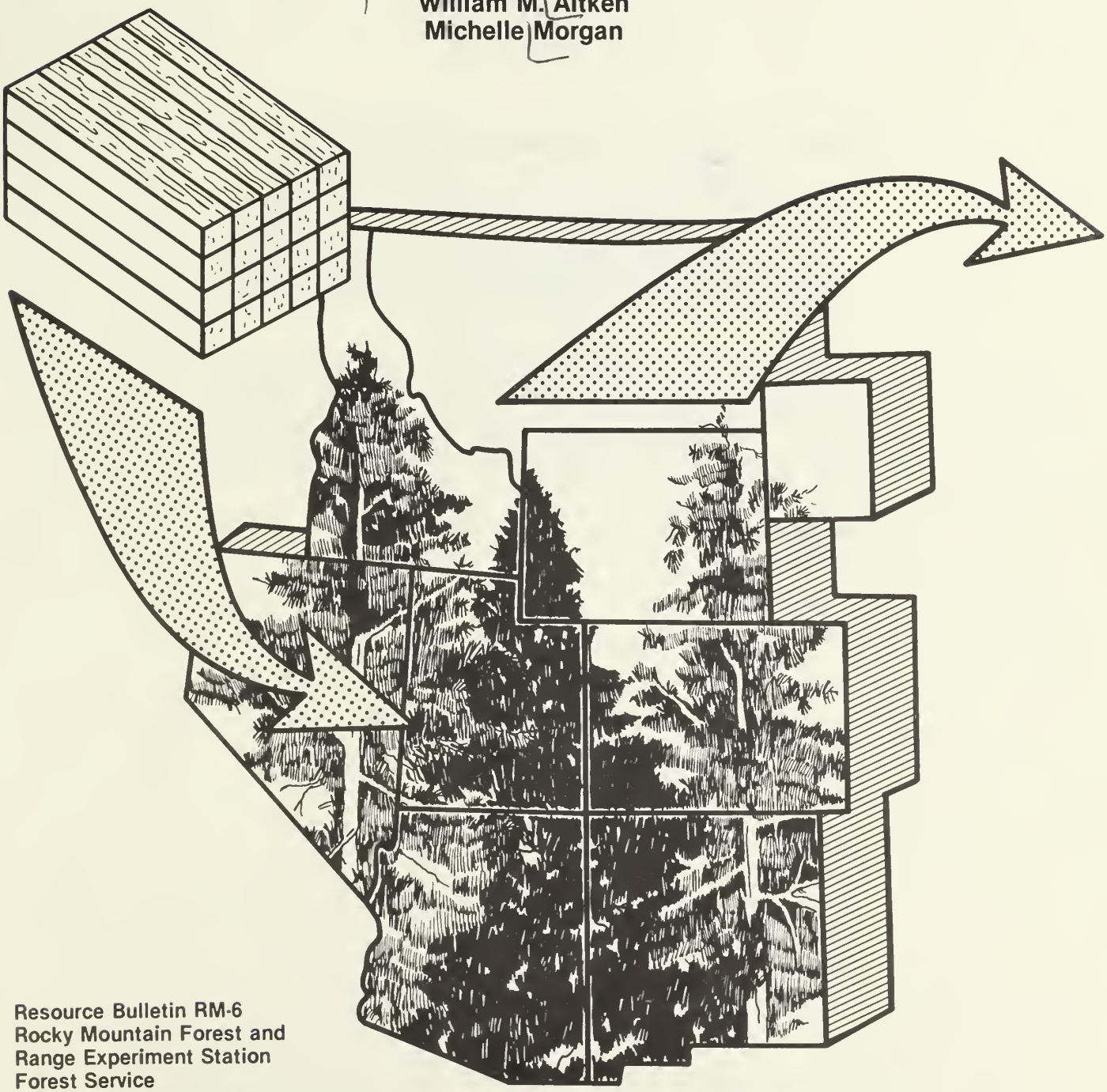

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Central and southern Rocky Mountain states have enough harvestable timber to supply their own needs for many lumber classes, and potentially, for products such as plywood and particleboard. However, wood products continue to be imported in large volumes. Market channels, perceived quality differences, and relatively less product variety available locally contribute to this situation.

Keywords: Wood products, forest products, markets, product distribution

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Wood Product Flows and Market Structure in the Rocky Mountain States

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MANAGEMENT IMPLICATIONS

Forest resources of the Rocky Mountain states (Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, South Dakota, Utah, and Wyoming) can be managed for a desired mix of multiple-use benefits only if there are economically viable opportunities for marketing the logs from timber harvest. At present (early 1983), such opportunities are limited.

Generally adverse economic circumstances in the national economy affect the timber industry. Also, disproportionately higher costs of harvesting and processing timber in the Rocky Mountains increase the economic risk of producing timber products in this region. Under these circumstances, the most feasible approach to improve timber utilization and marketing is to upgrade the value of existing products or to provide new higher value products. This has been successful in the Rocky Mountain states in several isolated instances. However, Rocky Mountain timber processors generally either depend on economies of scale in producing commodity products that are sold in highly competitive markets, or they produce small quantities of rough cut products sold in local markets as specialty items.

The study reported here indicated that expansion and diversification of outlets for Rocky Mountain timber could support needed resource management. However, to achieve a suitable relationship would require not only an increase in traditional production, but development of valuable new products as well. One approach in areas where large diversified firms are not typical would be to develop more secondary manufacturing operations that have potential for creating higher product values. Another possibility, that would take advantage of the region's expected growth in residential, commercial, and industrial construction,[4] is to concentrate on specialty products, for which market competition may be less severe. For example, ponderosa pine is well-suited for furniture, cabinets, or other products where "workability" is important. In addition, the relative ease of treating ponderosa pine with wood preservatives makes this species ideal for wood foundations, posts, and poles. Because of possible increases in underground mining in some Rocky Mountain states, mining requirements for timbers may offer a new area of expansion.[5,6] Composite panel products and laminated lumber products have been suggested as potential ways of increasing production and market penetration.[4] A recently completed study (Markstrom and Worth 1981) underscores favorable prospects for particleboard production in the Black Hills. Demand for firewood in the region is expected to continue to increase in the near future, providing additional outlets for small roundwood.

The region's forest products firms, especially small and medium sized operations, might strengthen their competitive position by considering the following marketing strategies:

1. Identify markets for, and produce, specialty products for which market volumes and prices are less volatile and for which local species can compete economically with imported products.
2. Gain expertise in direct marketing of products to retailers or industrial users, so that Central and Southern Rocky Mountain (CSRM) producers may advantageously ship their products to eastern markets.
3. Establish cooperative marketing strategies to offer more complete, good quality product lines.
4. Inform customers and others about the uses and advantages of CSRM products.

This bulletin describes what is known about forest product flows into, within, and out of the Rocky Mountain states. "Hard" data on flows are scarce, and filling in the gaps is an extremely costly and time-consuming task—an analysis that is beyond the scope of the resources available here. Given these limitations, and considering the importance of starting an analysis on this subject, it was decided to organize the available data to portray product flows as well as possible. Then product flows were estimated using projection, extrapolation, or ratio techniques, where it would enhance the understanding of flow patterns. Readers are cautioned that individual estimates should be used with awareness of their limitations, considering that data from most sources could not be verified and that some of the estimating procedures were subjective.

[4] *Brenner, R. N. et al. (1977). Production and marketing strategies for utilizing beetle-killed and associated Front Range timber. Department of Forest and Wood Sciences, Colorado State University, Fort Collins. [Unpublished report.]*

[5] *Smego, J., and D. R. Betters. (1979). Production and marketing alternatives for utilizing lodgepole pine in Colorado and Wyoming. Colorado State University Project No. 31-1470-2219, Department of Forest and Wood Sciences, Fort Collins. [Unpublished report.]*

[6] *However, timbers are in competition with other support materials such as steel rock bolts and even cinder blocks. Steel rock bolts apparently have a lower cost installed and offer less restriction to in-mine air flow. In addition, where wood is used in the central Rocky Mountain area, many "hard rock" mines use timbers of interior Douglas-fir from Idaho. Personal communication, April 8, 1982, from J. A. Fullenwider, State and Private Forestry, Rocky Mountain Region, USDA Forest Service, Lakewood, Colo.*

INTRODUCTION

Among the several reasons for owners and custodians of forest land to harvest timber, two are dominant for the central and southern Rocky Mountain states (CSRM).[7] First, harvesting trees is the primary means of manipulating forest vegetation to maintain or increase the multiple benefits from forest resources. Second, harvested timber provides raw material for industrial activity that helps meet national product requirements.

Timber harvesting is a significant element in the region's social and economic health and need not conflict with other environmental goals. However, to avoid damage to the region's sensitive ecosystems, timber harvesting must be carefully planned and executed. The higher costs associated with such harvesting are a challenge to economic operation, and ways must be found to cover these higher operating costs. The kinds of products produced, the efficiency with which they are produced and marketed, and the availability, and suitability of raw materials are the keys to economic wood product manufacture and to the future of forest land management in the Rocky Mountains.

Appropriate markets for manufactured wood products are essential to timber harvesting. Local markets in the CSRM states are presently served by a mix of locally produced and imported products. A common misperception about timber products manufactured in the Rocky Mountain states, especially lumber, is that they cannot compete on a quality basis with products manufactured in other western regions. The result is that numerous markets in the Rocky Mountain states, for a wide range of product types and grades, continue to be filled by imported products, even though local products could meet required performance standards. At the same time, significant volumes of timber products manufactured in the Rocky Mountains are exported to other regions.

There is a lack of current basic information related to forest product flows within the region although various aspects of marketing and production in the Rocky Mountain states have been analyzed and reported (Hutchison 1957, Williams 1964, Adair 1966, Wilson and Spencer 1967, Williams 1967, Yerkes et al. 1968, Setzer and Wilson 1970, Keegan 1980, Godfrey et al. 1980). Other forest product flow studies (Holland and Judge 1963, Bruce 1969) include information that covers more than the Rocky Mountain states. However, volumes of forest products, principally plywood and lumber, that are now produced and consumed may have changed significantly because of reductions in the number of active mills in the study region and because of major increases in regional population. Very little is known, and even less has been published, about these changes.

Information concerning local demand for products, by type and grade, would be especially helpful. For example, are exported products essentially different from imported ones? Are the region's products limited to production of lower grade, lower values types of products? Information about these topics and the reasons behind the current regional import/export balance would help to determine whether better use can be made of the region's timber resources.

The purpose of this study was to gather and organize available information about the volume of timber products moving into, through, and out of the Rocky Mountain states. Although many different kinds of wood products are consumed in the CSRM states, this study dealt primarily with major products that either are produced locally or are consumed in large volumes, such as lumber, plywood, posts and poles, and pulpwood. In addition to product volume, distribution of lumber and panel products in the CSRM states was investigated also.

Specific objectives of this study were (1) to estimate the volume of major timber products produced in, consumed in, imported into, and exported from the Rocky Mountain states, and (2) to describe the market structure for major softwood products in the CSRM states and to evaluate how local products fit this market structure.

METHODS

VOLUME ESTIMATES[8]

Wood product quantity estimates were based on a variety of secondary data sources, including published industry data, census reports, transportation statistics, etc. Because of the differing nature and quality of data sources, rigorous statistical analysis was not possible. Estimates given represent a summary of what is available from secondary sources, augmented by further projections and interpolations.

The major products considered were lumber, plywood, pulp, posts, and poles. The year 1976 was used as a base. Data were most readily available for those products and that year.

Figure 1 shows the basic conceptual relationships for lumber. Forest industries in the Rocky Mountain states, however, produce a wide variety of products from local species.[9] Each product may have one or more grades based on species, strength, appearance, and other technical wood properties. Product flow concepts for these other products are similar to those for lumber.

In this study, end uses were separated geographically into two categories—the Rocky Mountain states and elsewhere. Thus, products manufactured in the Rocky

[7] *In this report, the states of Arizona, New Mexico, Colorado, Wyoming, and the western portion of South Dakota are called the Central and Southern Rocky Mountain (CSRM) area.*

[8] *The reader should be aware that the geographic scope and method for the first objective differs from that for the second. For objective 1, available data and the desire for a sufficient scope pointed to inclusion of all Rocky Mountain states. For the second objective, however, forest type, available transportation, population distribution, and available resources indicated a somewhat more narrow scope—the central and southern Rocky Mountains.*

[9] *Predominant species are lodgepole and ponderosa pines and Engelmann spruce. To a lesser degree, other species are Douglas-fir (Inland), subalpine fir, and aspen.*

Mountain states either are consumed within the Rocky Mountain states or shipped outside the local area. Manufacturers from outside the Rocky Mountain states also ship products into the Rocky Mountain states.

Aggregated information on product volumes shipped into and shipped out of the region are not necessarily useful for product flow analysis. It is more important to analyze such shipments by product type and/or grade. For example, such analysis may reveal that certain products imported into the Rocky Mountain states are not generally available from local production.

Although this idea of product accounting is straightforward, collecting data for empirical analysis is difficult. Government agencies generally do not maintain consistent data series on regional flows of forest products. Industry trade associations sometimes publish or may be willing to share statistical data on product shipments, by region. The lumber and plywood industries have some relevant regional data, for example, but for other products, no such industry data exist.

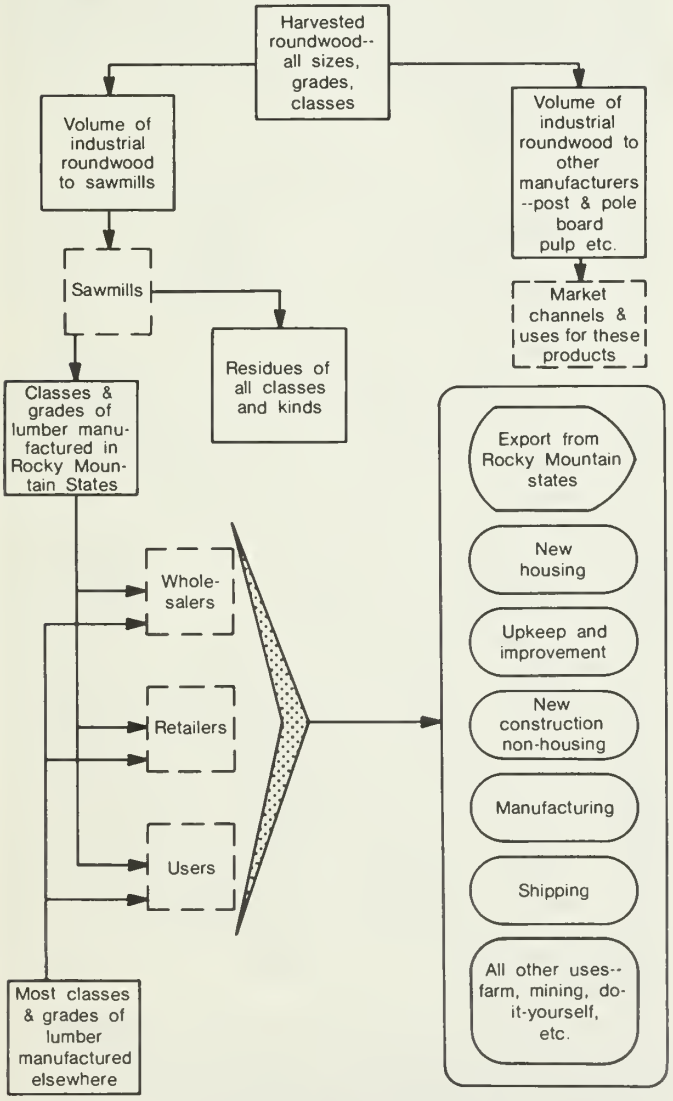
Harvested roundwood-- all sizes, grades, classes
Volume of industrial roundwood to sawmills
Volume of industrial roundwood to other manufacturers --post & pole board pulp etc.
Sawmills
Market channels & uses for these products
Residues of all classes and kinds
Classes & grades of lumber manufactured in Rocky Mountain States
Export from Rocky Mountain states
New housing
Upkeep and improvement
New construction non-housing
Manufacturing
Shipping
All other uses-- farm, mining, do-it-yourself, etc.
Whole-salers
Retailers
Users
Most classes & grades of lumber manufactured elsewhere

Figure 1.—How wood products flow through market channels.

Lumber

Production figures for lumber were available from a variety of sources (U.S. Department of Commerce 1977, Western Wood Products Association 1977). Consumption figures were calculated for each major use category using the methods of derivation described below.

New housing.—Separate figures were derived from existing information on volumes of lumber consumed in the four major classes of new housing, i.e., single family structures (USDA Forest Service 1970), two-unit structures (USDA Forest Service 1973), multi-unit structures (Wright and Reid 1972), and mobile homes (Dickerhoof 1978). By multiplying the per-unit consumption figure by the number of construction starts in each particular class (National Association of Home Builders 1978), total lumber use in that particular consumption category was estimated for the study region.

Manufacturing.—Lumber consumed in this category was estimated by taking the region's percentage of total United States value of shipments in the manufacturing industry (U.S. Bureau of the Census 1974a) and multiplying it by the figure for total volume of wood consumed nationally in the manufacturing industry (USDA Forest Service 1973).

Shipping.—The lumber consumption of this industry was estimated by the same procedure and from the same sources as used for the manufacturing industry.

New nonresidential construction.—The total volume of lumber consumed in the United States for new nonresidential construction (U.S. Department of Agriculture 1980) was multiplied by the region's percentage of total United states value of construction contracts (U.S. Bureau of the Census 1977a).

Residential upkeep and improvement.—Volume of lumber consumed in the Rocky Mountain area in this category was estimated by calculating the average number of persons per housing unit in the West and dividing the population of each state in the Rocky Mountain area (U.S. Bureau of the Census 1977b) by this figure. This procedure provides the estimated number of housing units in the Rocky Mountain area. The total volume of lumber consumed in residential upkeep and improvements (U.S. Department of Agriculture 1980) for the United States was multiplied by the percentage of residential housing in the study region to give a figure for lumber consumed in the study region.

All other uses.[10]—The total volume of lumber consumed in the United States in this category has been estimated by others (U.S. Department of Agriculture 1980), as has the total U.S. volume of lumber consumption for all U.S. consumption categories (U.S. Department of Agriculture 1980). The "all other uses" consumption in the U.S. can be expressed as a percentage of total U.S. lumber consumption in all categories. A total figure for lumber consumption in "all other uses" was estimated for the study region by assuming that the

[10]*All other uses include upkeep and improvement of nonresidential buildings and structures; mining; made-at-home projects, such as furniture and boats; made-on-the-job items, such as advertising and display structures; and a wide variety of other miscellaneous products and uses.*

Rocky Mountain region's percentage of "all other uses" lumber consumption, in relation to total CSRM lumber consumption, is the same as the national percentage.

Plywood

Softwood plywood production figures for the study region, available from two different sources (American Plywood Association 1977, Forest Industries 1977), were compared. Figures provided by the American Plywood Association (APA) (1977) represent shipment volumes for the Inland Region. The geographical boundaries for this region include the Rocky Mountain area and that portion of Washington and Oregon east of the Cascade Mountains. Because this latter area was not included in the Rocky Mountain study area boundaries, it was necessary to subtract the volume of softwood plywood produced in Washington and Oregon from the total volume given by the APA for the Inland Region to estimate production figures for the study region. The total shipment volume shown in the APA data differed substantially from the volume found by summing individual mill production volumes reported in Forest Industries (1977). This difference probably can be explained by the fact that APA can assess only the production of its member companies and must estimate production of nonmember mills. In contrast, Forest Industries questioned all individual mills. These figures may represent capacity instead of volume produced. The individual mill totals reported in Forest Industries (1977) were totalled in this analysis, because they were theoretically more complete. However, the data gathered by APA for their member mills may be more accurate for that segment of the industry.

Data to quantify volumes of softwood plywood imported into and exported from the study region were sketchy and hard to find. The 1972 Census of Transportation (U.S. Bureau of the Census 1974b) was not applicable because data were reported for regions whose boundaries did not conform to boundaries of the study region. In addition, forest products volumes were aggregated for groups that included several different products. Census figures for plywood were combined with millwork and prefabricated wood products, making the data inappropriate for estimating local plywood import and export totals. The APA's Geographical Analysis of Plywood Shipments (1977) provided reliable information for their member companies' shipments originally destined for the study region, but did not track shipments that were later diverted to destinations outside the study region, nor did it cover nonmember producers. To the extent that this occurred, volumes shipped to the region according to APA data would not equal the plywood consumed in the region. Therefore, the method and sources for calculating softwood plywood consumption were the same as described previously for lumber consumption.

Posts and Poles

Production figures on volumes of timber harvested for posts and poles (P&P) are available for 1976 from the USDA Forest Service for national forest (NF) lands.[11] Because similar production figures were not available for other commercial forest lands, estimates were derived by assuming that cutting patterns for all commercial forest lands were similar to those for national forests.[12] Thus, in order to estimate timber volume cut for posts and poles from all forest lands, the relationship between ratios of post and pole volume cut and acres of commercial forestland was used (U.S. Department of Agriculture 1980),

$$\frac{\text{Timber volume cut, P\&P, NF land}}{\text{Timber volume cut, P\&P, All forest land}} = \frac{\text{NF commercial timberland area}}{\text{All commercial timberland area}}$$

No allowance was made for timber harvested for poles that proved unsuitable during processing.

Post and pole consumption data for the study region were derived by multiplying the total acreage of farmland in the region (U.S. Bureau of the Census 1976) by the average post and pole consumption per acre in Colorado (Betters et al. 1977). The estimates derived were further subdivided into utility poles, barn poles, fence posts, and corral poles.

Product	Volume consumed *cubic feet*
Utility poles	2,302,629.6
Barn poles	530,956.2
Corral poles	1,241,384.8
Fence posts	2,824,776.2

This procedure assumes post and pole consumption per state was directly related to total farm acreage within that state but not related to average acreage per farm. It also assumes that there are no intraregional differences in the consumption of wood posts and poles.

The approach to estimating consumption of posts and poles could be much improved if data were available explicitly for each of the four classes of product noted previously. Consumption within each of the product classes responds to driving forces that are not comparable among all classes. Ideally, each class should be treated differently throughout the estimation procedure. For example, consumption of utility poles is hypothetically a direct function of population density and only indirectly a function of agricultural acreage. Further, agricultural consumption of fence posts varies by type of farm. Ranches would tend to use less posts per acre than would crop-livestock farms. Farms producing only field crops may likely tend to use even fewer posts per acre, regardless of size. In any case, data are not generally available from secondary sources to support this type of analysis.

[11] *Each Regional office of the USDA Forest Service issues quarterly reports titled, "Timber Cut and Sold, File No. 2490."*

[12] *We recognize this assumption may not be tenable. On the other hand, there is no evidence of which we are aware that indicates any other scenario. Estimates of production of posts and poles, indeed all forest products, would be useful research.*

No data were found on imports and exports of wood posts and poles from CSRM states to adjoining states. However, some Colorado respondents in at least one survey (Betters, et al. 1977) indicated that fence posts they acquired came from contiguous neighboring states including Oklahoma but excluding Utah, and from South Dakota, Idaho, and Montana. There may be a significant flow of fence posts between neighboring states within the Rocky Mountain area and to states in the Great Plains and western Midwest, but these flows, if they exist, are not discernible from existing secondary data.

Pulp and Pulpwood

The total volume of paper and board produced within the study region was calculated from published mill capacities and pulp production figures available for the three mills in the Rocky Mountain region (Pulp and Paper 1977). Volumes of wood (solid wood equivalent) necessary for the production of this volume of pulp were calculated using standard pulp conversion factors for the major western tree species[13] (Hartman et al. [no date]). Data about timber volumes cut for pulpwood production in the study region, for 1976, were available only for national forest lands.[11] To derive a figure for timber cut on all commercial forest land, it was necessary to make the gross assumption, as was done for posts and poles, that cutting patterns were similar for national forests and all other lands. A total figure for timber cut for pulpwood was found by computing the ratio of national forest commercial timberland to total commercial timberland (U.S. Department of Agriculture 1980) and then equating this figure to the ratio between timber cut for pulpwood on national forest land[11] and timber cut for pulpwood from all Rocky Mountain commercial forest land.

Regional consumption figures for paper and board were derived by multiplying per capita consumption figures (Pulp and Paper 1977) by the population in each of the Rocky Mountain study states for 1976 (U.S. Bureau of the Census 1976). The volume of pulp products consumed in the Rocky Mountain region for 1976 was estimated by multiplying regional population (U.S. Bureau of the Census 1976) by the per capita consumption of pulp products in the United States for 1976 (U.S. Bureau of the Census 1977a). No export data were readily available for pulpwood. Import data were available for pulp and pulp mill products for 1972 (U.S. Bureau of the Census 1974a), but not for 1976.

MARKET STRUCTURE

Details of research to describe and evaluate market structure are described by Hasty et al.[14] After examining available secondary sources, they determined that primary data collection would be the most efficient method of obtaining the needed information.

Therefore, they collected information from as many firms as possible within forest products industry in the central and southern Rocky Mountains (Table 1). Data were obtained for major products moving into, through, and out of the CSRM states. Hasty and his associates focused on lumber and millwork, but particleboard and

[13] *Interior Douglas-fir, ponderosa pine, western white pine, and western red cedar.*

[14] *Hasty, Ronald W., Michelle Morgan, and Ellen Sheeley. 1981. The market structure for major softwood products in the central and southern Rocky Mountain area. 81 p. Department of Marketing, Colorado State University. [Unpublished Report.]*

Table 1.—Description of the sample

Type of firm	Number of firms located	Number of inquiries mailed	Number of undelivered inquiries	Number of usable returns	Percent usable returns
Lumber Mills	242	242	31	46	21.8
Wholesalers	209	209	20	53	28.0
Retailers					
Lumber	310	260	[3]9	59	[3]25.6
Home Center	26	26		12	
Users					
Contractors[1]		100		17	
Building Material	87	87	[3]22	22	[3]21.9
Other	[2]76	76		14	

[1] *The number of contractors listed in various directories are in the hundreds. Hasty chose the sample to represent population proportions by state.*

[2] *Other users are defined as furniture manufacturers, cabinet manufacturers, pallet and crate manufacturers, and any miscellaneous responses.*

[3] *From both categories.*

plywood were also covered. The geographic area surveyed was western South Dakota, Wyoming, Colorado, New Mexico, and Arizona. Montana, Idaho, Nevada, and Utah, included in the analysis for volume estimates, were not considered here. Their inquiries were concerned with the attitudes toward CSRM wood products expressed by respondents in the major market distribution channels for these products.

RESULTS

PRODUCT FLOWS

These findings represent overall product flows as they were in 1976, based on estimates from available secondary data and such additional estimates as described. Detailed figures for lumber production and consumption, plywood consumption, post and pole consumption, and mill residues are shown in tables A-1 through A-5.

Table 2 shows the overall results of the product flow part of the study. This table covers lumber, plywood, and posts and poles. Pulp and paper is dealt with separately for reasons explained later. For each commodity, the volume produced plus the volume imported represents the total volume available for use in the Rocky Mountain states. This volume is reduced by the volume consumed plus the volume exported from the Rocky Mountain states.

In theory, there should be no surplus or deficit resulting from these calculations if all volumes are accountable. However, to the extent that secondary data were incomplete, there are inconsistencies in these results which are discussed later.

Table 2.—Summary of product flow data.

	Lumber	Plywood	Posts and Poles
	MMBF-LT[1]	*MM ft.*[2], *3/8-inch basis*	*M ft*[3]
Produced	4,292	1,212	7,666
(+) Imported	2,808	823	
Total volume available	7,100	2,035	
Less:			
Consumed	2,264	1,481	6,900
Exported	3,018	947	
Total volume	5,282	2,428	
Surplus (+) or deficit (−), volume not accountable	1,818 (+)	393(−)	766 (+)

[1] *MMBF—LT-Million board feet, Lumber Tally.*

While it is logical to assume that the Rocky Mountain area might be self-sufficient with respect to lumber, and posts and poles, and to some small degree plywood, this assumption most certainly does not extend to pulp and paper products. With pulp and paper mills only in Arizona, Montana, and Idaho, the region likely exports large volumes of pulp and paper products of specific varieties manufactured in these states. Conversely, the region likely imports a wide variety of pulp and paper products in quantities proportional to populations and number of businesses. Thus, pulp and paper products are not expected to have balanced figures for import and export.

In 1976, the Rocky Mountain region consumed 3.1 million tons of paper and board products, while producing about 748 thousand tons of paper and board products. For pulp products, the region consumed an amount equivalent to 229 million cubic feet of timber. In turn, pulp mills in the region produced about 1.5 million tons of pulp, an amount equivalent to about 220 million cubic feet of timber. However, in the Rocky Mountain region only about 35 million cubic feet of timber actually was cut for pulp production. Thus, forest products residues or recycled material such as paper, rags, etc. went into pulp and amounted to about 185 million cubic feet of timber equivalent.

MARKET STRUCTURE[14]

Channels of Distribution

Within CSRM States

Producers in the central and southern Rocky Mountains sell their products to a variety of outlets in addition to consumer end users. Table 3 gives figures that indicate what proportion of dollar sales volume flows from one member of the market channel to another. For example, producers sell 31.5% of their dollar sales volume to lumber wholesalers, 10.3% to retailers, etc.

Wholesalers further distribute products purchased locally and from outside the CSRM area. For example, wholesalers who responded indicated that 57.9% of their dollar sales volume goes to retailers. One interesting sidelight is that wholesalers trade small volumes to other wholesalers, retailers trade to other retailers, and retailers also deal in small amounts with wholesalers.

Data on volume, quality, and quantity suggest that larger producers supplying major quantities of commodity products under industry quality standards generally market through wholesalers. However, fewer than 25% of the region's lumber producers who responded sell to wholesalers. The data suggest producers that sell directly to customers tend to produce selected categories of items for somewhat specialized markets. Examples are timbers for utilities and mines, common boards for household consumers, timbers and common boards for farm and ranch uses, and studs and timbers for contractors.

Table 3.—Flow of products from central and southern Rocky Mountain producers as a percentage of dollar sales volume

From: To:	Lumber Wholesaler	Retailer	Bldg. Contractors	Industry Manufacturers	Consumer and Other End Users
Producer	31.5	10.3	10.9	8.7	38.5
Lumber Wholesaler	4.5	57.9	9.7	18.1	9.9
Retailers	0.2	3.5	56.6	2.4	37.3

Imports to CSRM States

There are several ways products are imported into the CSRM area. Major volumes move from independent or affiliated mills to warehouse wholesalers, then to users or retailers in the CSRM states. Office wholesalers and brokers, who do not carry inventories, handle a large portion of the remaining business, selling to warehouse wholesalers and retailers. Retailers also purchase selected items directly from independent and affiliated mills outside the region. Item 1 in table 4 shows how many responding firms indicated they purchase some or all of their wood products from the CSRM area and how many said they buy no wood products from the CSRM area.

Exports from CSRM States

The majority of the wholesale and retail sales by the region's producers are to firms outside the CSRM area. Virtually all of the sales direct to end-users are to users in a CSRM state or, occasionally, an adjoining state. Wholesale transactions make up 30% of the total; retail sales, 10%; and direct sales, 60%.

Local Product Interaction with the Market

Mills

Of the forest product mills contacted, primarily producers of lumber, 85% indicated they market their products in the CSRM area, 11% indicated they market their products outside the CSRM area, and 2% indicated they market both in and out of the CSRM area.

Of those mills operators who indicated local marketing areas, 59% said their own primary product competition originated locally (i.e., elsewhere in the CSRM area). Thirty-one percent said their primary competition originated outside the CSRM area, and 10% said both areas. Lumber mills indicated that of all product classes they manufacture, light framing, studs, and timbers are the most susceptible to competition.

When asked why they thought competitive products are entering their market area, mill operators indicated two main groups of reasons. Forty-one percent said price differentials affected flow of competitive products. Thirty-three percent said specification of certain species by buyers affected flow of competitive products. Some mills gave both reasons in their responses. Price is straightforward when considered as a market motivation factor. However, the second perception, specification of certain species, is actually an overall indicator of a complex set of reasons having to do with perceived quality of product and service. Mill operators gave the following detailed responses when listing reasons why they feel competitive products are entering the CSRM area. The specific reasons are grouped into more inclusive categories.

Inclusive category	Specific reason	Percent giving this reason
I. Subjectivity	Preferences by buyers for certain species	19.6
	Bias against products produced locally	19.6
II. Availability	Quantity by grade or species	21.7
	Quantity by speed of service	6.5
III. Market channel	Established buying connections offering a wide range of products	19.6
	Local buyers affiliated with sole-source suppliers	13.0

The Market Channel

While the region's producing mills are the primary factor in overall market channels, secondary distributors also have an affect on, and perceptions about, CSRM products and their interactions with the market. Table 4 suggests why market channel members in the CSRM area make the decisions they do when consider-

Table 4.—Comparison of market channel members by selected attributes of the product buying decision. Numbers represent percentages of those who responded.

			Users	
	Wholesalers	Retailers	Manufacturers	Contractors
1. Purchase any wood products produced in the CSRM?				
Yes	72	63	77	47
No	25	32	17	24
Don't know	-	-	6	29
2. Decision to purchase based on:				
Price	55	42	43	24
Availability:				
By species	11	34	37	18
By grade	30	24	29	6
By speed of service	43	41	34	18
Quality	23	21	17	18
Market channel:				
Customer preference	11	7	11	12
Established business connections	30	34	46	29
3. Are some CSRM-produced products avoided?				
Yes	38	38	31	6
No	55	48	57	65
Don't know (DK) or No response (NR)	6NR, 2DK	14NR	12NR	35DK
4. Decision to avoid:				
Price	8	7	6	-
Not available:				
By needed quantity	8	4	9	-
By species	15	18	17	-
By grade	9	16	9	6
Product quality:				
Standards not met	19	23	26	6
Variation within grade	11	10	11	-
Does not meet building code	-	13	-	6
Market channel:				
Customer preference	9	7	-	-
Local buyers affiliated with sole-source suppliers	8	1	-	-

ing CSRM wood products. The first item shows the proportion of respective market channel members who said they purchase any wood products from the CSRM area.

For those market channel members who do purchase some products from the CSRM area, price and availability are important factors, as is the existence of established business connections. The positive effect of quality factors on the buying decision suggests that the quality of available products is at or above some acceptable standard set by each member of the market channel.

Although some products from the CSRM area are ordered by many members of the market channel, at least some products manufactured in the region are avoided by wholesalers, retailers, and manufacturers. Building contractors as a group seem not to consciously avoid CRSM products. However, for those members of the market channel who avoid at least some CSRM products, perceived quality and availability of local products are major factors influencing buying decisions. For example, availability of certain species seems important, as does compliance with standards for various products. For retailers in particular, one out of eight is concerned that products may not comply with standards set within building codes.

DISCUSSION

As indicated previously, the estimates and relationships depicted here, especially for product flow, should be interpreted cautiously. They are not precise measures of actual production and marketing levels. However, they may provide a reasonable insight into product flows in the Rocky Mountain region and, more specifically, in the CSRM area, until better production and market information is obtained.

PRODUCT FLOWS

Each of the major product groups in the CSRM states—lumber, plywood, posts and poles, and pulpwood and pulp—has its own particular flow pattern based on the nature of the product, comparative advantages of its manufacturing location, and sources of competing products.

Lumber

The volume of surplus lumber that was unaccounted for by the secondary data conceivably could be held in inventories within the region. However, this is probably not a realistic explanation considering the large amounts involved. One possible explanation is that data do not account for shipments originally destined for the study region that are diverted enroute to another location outside the study boundaries. If this is the situation, it would appear that the study area imports more lumber than actually occurs. However, the reverse could also occur (i.e., shipments destined for a location outside the study area could be diverted enroute to locations in the study region) with the result that imports would be undercounted. The first case is probably more likely because of the intricacies associated with the lumber marketing structure of the United States. For example, excess production in the Pacific Northwest and deficits in production in the Midwest and Northeast may cause lumber originally destined to the CSRM states to be transshipped further east instead. This activity would show more lumber imported to the Rocky Mountain states than is consumed.

A variation of the transshipment problem is temporary storage. Lumber destined for marketing areas inside the CSRM region may reach its initial destination but may be held there temporarily and then eventually reshipped to points outside the study area. Because this second shipment is not accounted for by available information, shipment data would tend to overestimate the actual volume of lumber used in the study region.

Lumber export data suggest that only about 30% of regional production was shipped to distributors inside the region. Of the 70% exported, the Midwest received the highest proportion (40.5%) (table A-2). The total export volume of 3017.8 MMBF, when related to the imports of 2,808.3 MMBF, indicates that regional production does not adequately serve the region's markets. This probably means that the region's products may not be sufficiently diversified to meet many of the region's requirements. This condition suggests there are limitations on the characteristics of Rocky Mountain raw materials as required for various specific uses. However, improved technology can help overcome many, if not most, of these limitations. Therefore, it appears that increased diversification of regional products is one way to improve the existing product-flow situation so that Rocky Mountain forests can supply more of the lumber products consumed in the region.

These interpretations are clearly speculative. Further research is needed on potential problems such as transshipment or product storage.

Plywood

Secondary data for plywood products indicated an unexplained negative regional flow amounting to 393 million square feet for 1976 (Table 2). It is unlikely that this figure represents volume pulled from existing regional inventories. However, a more probable explanation is a shipping destination problem similar to that encountered with lumber. That is, data used to compute regional imports and exports (American Plywood Association 1977) are based on original shipping documents at the producing mill. When a destination change occurs, as frequently happens for in-transit shipments, it is not reflected in APA records. In this study, there was no way to adjust product volumes to show such changes of destination while enroute.

Regardless of the actual flow of plywood products, in 1976, only Montana and Idaho of all the Rocky Mountain states produced plywood. This situation remains current. Therefore, it is not relevant or meaningful to

discuss plywood flow under the same premises as for lumber. More explicitly, the relatively few plywood producers in the northern Rockies cannot realistically manufacture all the species, grades, and sizes required to satisfy plywood needs in the more populous central and southern Rockies, though certainly some plywood from the northern Rockies is shipped to the CSRM area.

If plywood manufacture is seriously considered in the CSRM states, some findings from past studies should be considered.[15]

1. Customers may perceive critical differences in essentially similar products because of tradition or product promotion, resulting in high demand for certain plywood, for example, Groups 1 and 2 species (Douglas-fir, hemlock) in plywood in lieu of Group 3 species (spruce, ponderosa pine). Also, building code requirements may strongly influence plywood grades demanded.
2. Major CSRM species such as Engelmann spruce or ponderosa pine are less familiar plywood species, in many cases, so distributors are not conditioned to accept these species.
3. Many wholesalers do not stock spruce or pine plywood and will only sell it if it can be shipped in carload or truckload lots directly to the retailer or contractor.
4. To be competitive in strength properties with west coast Douglas-fir or southern pine plywood (Group 1), ponderosa pine or Engelmann spruce plywood producers must increase panel thicknesses relative to Group 1 specifications. This increases material and operating costs to the point where substituting pine or spruce plywood for Douglas-fir may not be feasible. Gardiner (1972) found that more general market acceptance of ponderosa pine and Engelmann spruce plywood would be a prerequisite for expanding this industry in the CSRM states. He felt industrial markets were the most promising outlets for this type of plywood.

However, recent developments in standards for structural wood panel products have modified some of the differences between plywood panels based on species and also between plywood and composition wood panels (American Plywood Association 1981). For example, under these newer American Plywood Association guidelines, panels are manufactured to standards that give performance characteristics for certain end uses. Species is not a factor if the panel performs satisfactorily.

Posts and Poles

Data needed to determine production, consumption, import and export of wood posts and poles ranged from sketchy to nonexistent. In terms of production capacity, it appears that the region could be self-sufficient. However, posts and poles cross regional boundaries in both directions for a variety of reasons. For example, the region's ponderosa pine is easy to treat with wood preservatives and makes good fence posts and small poles. But, it is seldom suitable for the larger poles required for power transmission lines. Posts and poles generally are not shipped long distances. Producers find that the low product value of most posts and poles limits the transportation costs these products can absorb and still remain profitable.

Brenner et al.[4] and Betters et al. (1977) indicated that states directly east of the study region offer good potential market outlets for some of the region's post and pole products. They concluded that corral poles would have to be sold somewhere within a 200-mile radius of a producer's plant in the Front Range area to yield a profit. Barn poles could be marketed beyond 200 miles, but lose their profitability if shipped much farther. Fence posts could be marketed over at least a 900-mile radius and still generate a profit, meaning that they could be marketed as far away as Chicago.[4] This indicates that the Front Range area of Colorado has possibilities as a source of fence posts for large agricultural and urban markets outside the study region. As a general rule, then, posts and poles appear to offer good market potential in local situations.

Pulp and Pulpwood

The region's mills produce a quantity of pulp and paper roughly equivalent to the volume of pulp products consumed within the region. However, much of the region's paper production is exported, while regional needs are filled, in part, by imported products. This apparent anomaly is a result of differences between grades produced and grades used in the region, plus normal competitive trade factors.

Pulpwood constitutes only a fraction of the raw material required for the region's pulp production. An increasing portion of this requirement is met by sawmill residues (i.e., slabs, edgings, chips, sawdust). Because stumpage, harvesting, and some processing costs generally are not assigned to sawmill residues, these raw materials are preferred over pulpwood, which must absorb all production costs. Residues, therefore, usually can be hauled considerable distances before their transportation costs exceed the cost of pulpwood at the mill. A drawback to complete dependence on sawmill residues of pulp mills in the CSRM region is that volume required is typically greater than volume available within economic hauling range of the pulp mills. Also, availability of these residues varies with sawmill production, which rarely follows the same market cycles as pulp production. This leaves pulp mills vulnerable to raw material shortages, unless they have the flexibility of using roundwood as well as the preferred residues.

Little or no pulpwood or sawmill residues are imported into the CSRM region. However, for the past two decades, the CSRM region has exported to Lake States mills substantial volumes of both. Virtually all of the pulpwood and much of the sawmill residues exported has come from the Black Hills area. These shipments were made feasible by favorable freight rates originally

[15] *Unless otherwise noted the following material is taken from Wangaard, F. F., and R. S. Whaley. 1971. Potential markets for plywood made from Rocky Mountain ponderosa pine and Engelmann spruce. 93 p. Department of Forest and Wood Sciences, Colorado State University, Fort Collins, Colo. [Unpublished Report]*

negotiated between Black Hills operators and the railroads, beginning in 1958 (Chicago and Northwestern Railway Company 1964). Colorado and Wyoming operators also have shipped residues and, occasionally, pulpwood to these same markets. In recent years, rising freight rates have increasingly threatened the economic feasibility of these markets, with the result that shipments have decreased. Surpluses of small timber and sawmill residues are likely to grow in these CSRM areas as export markets decline. In 1974, before the recent increase in the use of wood for energy, it was estimated that unused, annual volumes of sawmill residues in the Black Hills alone amounted to 35.3 million cubic feet (table A-5).[16]

MARKET STRUCTURE

The forest products industry is essentially a commodity business. Products must be available on demand in economical purchase quantities that meet standard specifications at the lowest possible price. For the bulk of the industry's production, there is little opportunity for differentiation of the physical product except for certain species preferences that affect product choices. However, there are other ways to differentiate CSRM wood products. For example, packaging with weather resistant wrapping, reducing handling costs, and invoice systems would all contribute to defining a total product that is different than others.

Because wholesalers are the primary source of supply for retailers and manufacturers, and a significant source of material for contractors, they tend to determine which products flow through the distribution channels. This study found that many wholesalers avoid, or at least do not seek out, CSRM products. This situation may be understandable considering the nature of the commodity business. Because wholesalers desire convenience and avoid risk, they tend to purchase from just a few of the many possible sources in order to gain access to a complete product line in large quantities, at low prices, and with consistent quality. Additional factors in wholesalers' buying decisions that seem to work against CSRM products include preferences for species not available in the CSRM area, concerns about adequately dried lumber, and in some cases, building code restrictions.

Such factors can contribute to the situation noted earlier where some of the lumber products imported into the CSRM area seem to be identical to products shipped elsewhere from the CSRM area. Thus, CSRM wholesalers would order from elsewhere lumber products not readily available locally, for example select and finish grades or perhaps some sizes of structural dimension. Concurrently though, because of convenience and possibly bulk shipping cost factors, they order products from elsewhere that are available locally—for example, some grades of common boards and light framing lumber. In contrast, local producers satisfy only part of the local CSRM requirements for these products but ship significant volumes out of the CSRM area, usually east.

Retailers exercise less influence over the market because they usually purchase primarily from wholesalers. Their primary customers are contractors and household consumers, who have even less influence on commodity product choices.

CSRM mills recognize that they must compete for the bulk of the contractor, manufacturer, and consumer business through established wholesaler-retailer channels. While price competition with large Northwest and Inland Empire producers is a factor, quantity and quality control problems may be even more important than price in commodity markets. As an alternative to commodity products marketed through wholesale channels, a number of mills in the CSRM states also successfully developed direct local markets for specialty products. About 60% of the CSRM output goes to such markets. In addition, some CSRM mills are also reaching non-CSRM area markets directly, thereby creating stronger proprietary relationships with their customers.

CONCLUSIONS

Although the CSRM region now has more than enough harvestable timber to supply its own needs in many wood product classes, it continues to import significant quantities of lumber, plywood, and paper. This situation results, in part, from production deficits in some product categories. In other cases, market preferences and the market structure appear to discriminate against the region's products because of real or imagined differences in quality between local and imported items.

Brenner et al.[4] and Sampson et al. (1980) listed a number of reasons for the low level of production in 1977. Some of the problems they cite that face Colorado's wood products industry include (1) unsuitable product quality, (2) limited product variety in comparison to the total range of possible products required, (3) inability to maintain a steady flow of product, and (4) undetermined bias against Colorado products within the State. Although these problems were associated specifically with Colorado, they may be typical of the majority of the states in the study region, with the exception, perhaps, of Idaho and Montana.

With the region producing more lumber than was consumed in 1976, it might be expected that imports should have been small. Because this was not the case, it is probable that lumber manufactured in the region lacked the grade and product diversity required locally, resulting in the import of products not manufactured in the region (for example, higher quality boards[17]) and the export of local lumber products of types produced in excess of regional demands.[16]

[16] *Source material for this statement is found in five publications from the Forest Survey Research Work Unit at the Intermountain Forest and Range Experiment Station. They are Setzer and Throssell (1977a), Setzer and Barrett (1977a), Setzer and Shupe (1977), Setzer and Barrett (1977b). and Setzer and Throssell (1977b).*

[17] *Higher quality boards, in this case, refers to #1 and #2 Clear boards, Select and #1 and #2 Common boards.*

A possible method for improving local markets is greater product diversification. This may require efforts to upgrade products and to show local consumers that Rocky Mountain timber is not inferior to timber from other regions. Although not addressed in this study, further work could identify and evaluate beliefs about CSRM wood products held by consumers.

Certain marketing peculiarities exist for some states in the CSRM region. The two highest valued products produced in Colorado and Wyoming, planed boards and studs, are largely marketed in Illinois and Wisconsin, while timbers are shipped mainly to Kansas and Missouri. Other Colorado and Wyoming products are marketed mostly in these same four states. The reason for this appears to be that the higher value products can be shipped longer distances and still remain profitable, while lower valued products cannot support high transportation charges and must be marketed closer to their source. Rising prices for locally finished wood products may change this marketing pattern. Rising transportation costs could make local markets more appealing to the region's producers if these increases were not offset by higher product prices at more distant markets.[5]

Because the CSRM region contains no plywood production capacity, substantial quantities are imported. Unless potential producers are convinced that viable markets exist for plywood made from Engelmann spruce and ponderosa pine, for example in underlayment, sheathing, crates, boxes, etc., the current market structure for softwood plywood is likely to continue. Donnelly and Worth (1981) showed under what conditions plywood production is possible in the Black Hills area. These results could be adapted by further research to other locations in the CSRM states. In addition, there are other areas in the CSRM region where reconstituted wood products such as particleboard or composition board might be manufactured (Markstrom and Worth 1981).

The region's post and pole production has an importance greater than its volumes would indicate in relation to the total regional forest products output. Effective management of timber resources includes balanced utilization of sapling- and pole-sized timber as well as sawtimber. Because the region contains large areas of timber less than sawtimber size that needs stand improvement, management of such stands would result in reduction of stand overcrowding, stagnation, insect damage, and disease and yield large volumes of pole-sized timber. However, to achieve this goal, steps must be taken to improve the marketing opportunities for small timber (e.g. posts and poles).

Business techniques such as sales promotion and product diversification are needed to help expand regional and out-of-region trade (Betters et al. 1977). In particular, several positive steps would increase chances for better utilization of local wood species.[18]

[18]*Based on a personal communication August 23, 1982 from Vern P. Yerkes, Timber Staff, Southwestern Region, USDA Forest Service, Albuquerque, N. Mex.*

1. CSRM producers could combine to seek further acceptance of local species in the trades and the consumer marketplace through changes in unjustified code restrictions, tests and demonstrations of their products, and advertising and promotion carefully targeted on the most advantageous markets.
2. New products must be developed and tested in the marketplace.
3. Recognize the relatively favorable geographic position of CSRM producers with respect to populous Midwestern and other east-of-the-Rockies markets.

Because the region contains large supplies of small ponderosa and lodgepole pine roundwood, both excellent pulping species, it appears that pulp should be a forest product of great potential in the Rocky Mountain region. Now, the region does not completely utilize existing mill residues for pulp and, in some cases, exports pulpable raw materials because of a lack of local outlets. The region probably could support one or more additional pulp plants, as suggested previously in the Chicago and Northwestern Railway Company study (1964).

However, additional factors must be recognized that could hinder pulp development within the study region. For example, scattered sources of raw material may dictate pulping processes that do not require large production facilities to operate economically. Also, these processes must use little water, and be largely free of pollution. Therefore, it probably is not realistic to expect installation of a chemical pulping plant, for example, that must operate at a level of 1,000 tons or more a day to be profitable. Rather, other pulping processes, such as thermomechanical or chemimechanical, may offer considerable promise when related to the region's population and economic expansion. Another factor related to pollution in a technical sense, but which is probably more of an information problem, is social objection to the concept of pulp mills. This perception is based on historical pollution problems that can be largely controlled with modern pulp plants. However, social perception must be changed before serious attempts at pulp production are politically and socially possible.

In summary, production and distribution of forest products in the Rocky Mountains, and particularly the central and southern Rocky Mountains, could be made more efficient if local timber resources were utilized to better advantage. More attention should be focused on serving regional markets with regional production. Product upgrading and diversification are key factors in achieving this goal. Further attempts should be made to increase the competitiveness, and hence value, of products that are exported. To maximize economic efficiency, only those forest products that cannot realistically be produced in the region should be imported.

Finally, the findings of this study suggest that the competitive position of forest industry in the central and southern Rocky Mountains could benefit from research with several main emphases. One research theme should be to illustrate the explicit tradeoffs involved in providing specific levels of lumber moisture content. For example, because of favorable climatic conditions, yard

drying of lumber is very attractive in the CSRM region. This process achieves substantial cost savings compared to kiln drying, but unless carefully controlled, yard drying may cause high marketing costs. A negative product bias related to occasional inadequately dried lumber may more than outweigh any technological cost savings associated with yard drying. Other research could explore the economic factors involved in a venture designed to channel commodity forest products from several local producers through a larger scale wholesale operation that could deal more effectively with large scale users. Research could further help identify specialty markets that would provide a buffer against the typically wide fluctuations in commodity markets.

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Appendix

Table A-1.—Estimated consumption of lumber (in millions of board feet) by use, in the study region, 1976

End use	Volume consumed
Housing	
Single-unit structure	1,038.4
Two-unit structures	32.7
Multi-unit structures	146.6
Mobile homes	38.8
Manufacturing	130.0
Shipping	48.1
New nonresidential construction	257.4
Residential upkeep and improvements	288.5
All other uses	283.4
Total	2,263.9

Table A-2.—Estimated exports (in millions of board feet) of lumber from the study region, 1976

Receiving region	Volume exported	Percent of total RM production
California	130.4	3.0
Midwest	1,739.7	40.5
Northeast	395.3	7.8
South Central	333.8	9.2
Southeast	366.7	8.5
Export (outside U.S.)	51.9	1.2
Total	3,017.8	70.2

Table A-3.—Estimated imports of lumber (in millions of board feet) to the study region from other U.S. shipping regions, 1976[1]

hipping region	Volume exported
California	421.3
Oregon	1,659.4
Washington	727.6
Total	2,808.3

[1]*Data are not available for lumber imported from Canada to the CSRM area.*

Table A-4.—Estimated consumption of plywood (in million square feet, 3/8-inch basis) by end use, in the study region, 1976

End use	Volume consumed
Housing	
Single-unit structures	713.4
Two-unit structures	18.8
Multi-unit structures	62.7
Mobile homes	7.7
Manufacturing	65.0
Shipping	5.1
New nonresidential construction	169.9
Residential upkeep and improvements	145.2
All other uses	293.8
Total	1,480.6

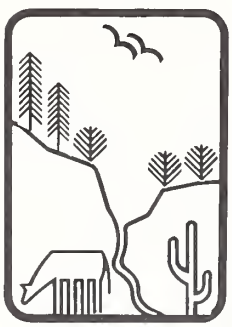
Table A-5.—Estimated volumes (in thousand cubic feet) of unused residue from sawmills in Arizona, Colorado, New Mexico, South Dakota, and Utah, 1974

	Unused bark	Residue coarse[1]	Fine[2]
Arizona	1,010	498	3,365
Colorado	3,853	2,070	4,285
New Mexico	3,264	2,543	5,109
South Dakota	1,801	416	1,677
Utah	1,547	2,179	1,715
Total	11,475	7,706	16,151

[1]*Material suitable for chipping, such as slabs, edging, and trimmings.*

[2]*Material such as sawdust and shavings.*

Rocky Mountains



Southwest

Great Plains

U.S. Department of Agriculture
Forest Service

Rocky Mountain Forest and Range Experiment Station

The Rocky Mountain Station is one of eight regional experiment stations, plus the Forest Products Laboratory and the Washington Office Staff, that make up the Forest Service research organization.

RESEARCH FOCUS

Research programs at the Rocky Mountain Station are coordinated with area universities and with other institutions. Many studies are conducted on a cooperative basis to accelerate solutions to problems involving range, water, wildlife and fish habitat, human and community development, timber, recreation, protection, and multiresource evaluation.

RESEARCH LOCATIONS

Research Work Units of the Rocky Mountain Station are operated in cooperation with universities in the following cities:

Albuquerque, New Mexico
Flagstaff, Arizona
Fort Collins, Colorado*
Laramie, Wyoming
Lincoln, Nebraska
Rapid City, South Dakota
Tempe, Arizona

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